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(71) Applicant and
(72) Inventor: **BEN-ARI, Tsafrir** [IL/IL]; 10600 Nahalal (IL).

(74) Agent: **FRIEDMAN, Mark, M.**; Beit Samueloff, 7 Haomanim Street, 67897 Tel Aviv (IL).

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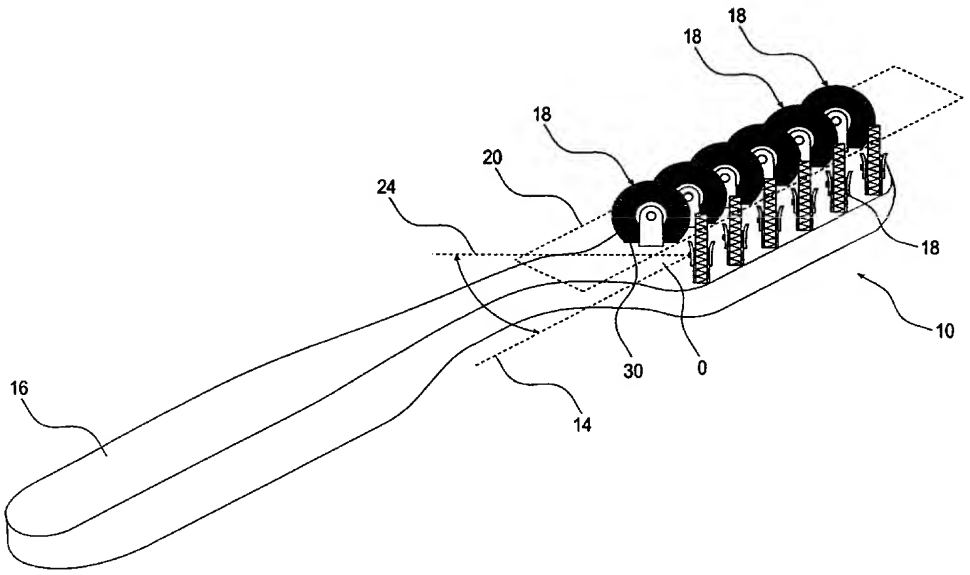
(54) Title: TOOTHBRUSH WITH LONGITUDINAL TO LATERAL MOTION CONVERSION




(57) Abstract: A toothbrush (10) has a number of rotatable brush assemblies (18) mechanically linked so as to move together with a handle (16). Each rotatable brush assembly (18) includes a wheel (22), with radially projecting bristles (26), configured to rotate about an axis (24) which is roughly parallel to a plane of contact (20) with the teeth. The axis (24) of rotation is inclined relative to a primary direction of insertion (14) of the toothbrush (10), corresponding to an extensional direction (14) of the handle (16), by an angle of between about 15° and about 75°, and preferably closer to 45°.

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# TOOTHBRUSH WITH LONGITUDINAL TO LATERAL MOTION CONVERSION

## FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to toothbrushes and, in particular, it concerns a toothbrush with longitudinal to lateral motion conversion.

It is known that best results are achieved by brushing teeth with an upwards and downwards action, thereby helping to remove food material stuck in the cracks between adjacent teeth. In practice, however, only a small proportion of users actually take the trouble to perform such a brushing action. Instead, most users revert to the much easier, but less effective, side-to-side brushing action.

In power-driven toothbrushes, this problem is commonly addressed by causing vibration or rotation of brush elements perpendicular to the handle (which is generally parallel to the side-to-side primary direction of motion). Examples of power-driven toothbrushes which employ such an action may be found in U.S. Patents Nos. 2,583,886 to Schlegel, 2,665,675 to Grover, and 5,864,911 to Arnoux et al.

In the field of manual toothbrushes, however, the problem is not so readily solved. A wide variety of toothbrush structures have been proposed in an attempt to produce a secondary up-down motion even when the user only actively moves the toothbrush in a side-to-side primary direction of motion. Many of these employ rotatable bristle-carrying elements deployed so as to rotate about an axis perpendicular to the primary direction of motion. Examples of such structures may be found in U.S. Patents Nos. 5,142,724 to Park, 5,186,627 to Amit et al., and 5,996,157 to Smith et al. None of these, however, has been found particularly effective.

An alternative solution is suggested in U.S. Patent No. 1,643,217 to Lazarus. Here, a spiral arrangement of bristles extends along a rotatable shaft

rotatably mounted parallel to the primary direction of motion. The description states that "the spiral arrangement of the bristle tufts tends to cause the bristle member, when rubbed against the teeth or the like, to rotate on the handle and so to bring a fresh surface continually into use." In practice, however, since the axis of rotation is parallel to the direction of motion, it is clear that little or no rotation would actually be induced.

There is therefore a need for a manual toothbrush which would effectively produce a secondary up-down motion when the user only actively moves the toothbrush in a side-to-side primary direction of motion. It would also be highly advantageous to provide a method for brushing along a row of teeth so as to generate a brushing action perpendicular to a direction of motion.

## SUMMARY OF THE INVENTION

The present invention is a toothbrush with longitudinal to lateral motion conversion.

According to the teachings of the present invention there is provided, a toothbrush for brushing teeth within a mouth of a user, the toothbrush comprising: (a) a handle configured to define a primary direction of insertion of the toothbrush into the mouth; and (b) a plurality of rotatable brush assemblies mechanically linked so as to move together with the handle, the rotatable brush assemblies being deployed so as to define a plane of contact with the teeth, each of the rotatable brush assemblies including a wheel configured to be rotatable about an axis, the wheel having a plurality of bristles projecting substantially radially therefrom, wherein each of the rotatable brush assemblies is configured such that its aforementioned axis lies substantially parallel to the plane of contact and is inclined relative to the primary direction of insertion by an angle of between about 15° and about 75°.

According to a further feature of the present invention, the axis of each of the rotatable brush assemblies is inclined relative to the primary direction of

insertion by an angle of between about 30° and about 60°, and more preferably, between about 40° and about 50°.

According to a further feature of the present invention, the plurality of rotatable brush assemblies includes a first group for which the axis of rotation is inclined in a first sense relative to the primary direction of insertion and a second group for which the axis of rotation is inclined in a second sense, opposite to the first sense, relative to the primary direction of insertion.

According to a further feature of the present invention, the first group includes a plurality of the rotatable brush assemblies arrayed along a first line substantially parallel to the direction of insertion, and wherein the second group includes a plurality of the rotatable brush assemblies arrayed along a second line, parallel to but displaced from the first line.

According to a further feature of the present invention, each of the rotatable brush assemblies includes at least one feature configured to inhibit rotation of the wheel in a given direction about the axis.

According to a further feature of the present invention, each of the rotatable brush assemblies is mounted relative to the handle via a swivel mounting such that the rotatable brush assemblies can swivel about a swivel axis substantially perpendicular to the plane of contact, the swivel axis being offset relative to the axis of rotation of the wheel.

According to a further feature of the present invention, there is also provided a toothbrush head portion integrally formed with the handle, the head portion including a recessed socket for each of the rotatable brush assemblies, a part of each rotatable brush assembly being received within a corresponding one of the recessed sockets.

There is also provided according to the teachings of the present invention, a method for brushing along a row of teeth so as to generate a brushing action perpendicular to a direction of motion, the method comprising: (a) providing a toothbrush including at least one rotatable brush assembly including a wheel configured to be rotatable about an axis, the wheel having a plurality of bristles projecting substantially radially therefrom; (b) positioning

the toothbrush with a number of the bristles in contact with a part of the row of teeth; and (c) moving the toothbrush along the row of teeth in a direction of motion, wherein the at least one rotatable brush assembly is oriented with its axis inclined at an angle of between about 15° and about 75° to the direction of motion such that rotation of the wheel caused by the movement generates a component of motion of the bristles substantially perpendicular to the direction of motion.

According to a further feature of the present invention, the at least one rotatable brush assembly is oriented with its axis inclined at an angle of between about 30° and about 60°, and more preferably, between about 40° and about 50°, to the direction of motion.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1A is a first schematic isometric view of a rotatable brush assembly being moved in a direction of motion to brush teeth according to the principles of the present invention;

FIG. 1B is a second isometric view taken along the direction of motion of Figure 1A;

FIG. 2 is a schematic isometric view of a first embodiment of a toothbrush, constructed and operative according to the teachings of the present invention;

FIGS. 3A and 3B are schematic isometric views of a wheel assembly and a socket, respectfully, together forming a preferred implementation of a rotatable brush assembly of the toothbrush of Figure 2;

FIG. 4 is a schematic cross-sectional view taken through the rotatable brush assembly of the toothbrush of Figure 2;

FIG. 5A is a plan view of the toothbrush of Figure 2;

FIG. 5B is a plan view of a first variant of the toothbrush of Figure 2, employing a staggered pattern of rotatable brush assemblies;

FIG. 5C is a plan view of a second variant of the toothbrush of Figure 2, employing variable angle rotatable brush assemblies;

FIG. 6 is a schematic cross-sectional view taken along line VI-VI of Figure 5C illustrating a preferred structure for the variable angle rotatable brush assembly;

FIGS. 7A and 7B are schematic isometric views of a wheel assembly and a socket, respectfully, together forming a first alternative construction of a rotatable brush assembly of the toothbrush of Figure 2;

FIG. 8 is a schematic cross-sectional view showing a suspended rotatable brush assembly for use in a toothbrush constructed and operative according to the teachings of the present invention;

FIG. 9 is a schematic cross-sectional view of an alternative suspended rotatable brush assembly for use in a toothbrush constructed and operative according to the teachings of the present invention; and

FIG. 10 is a schematic cross-sectional view showing a suspended rotatable brush assembly configured for implementing the mode of operation of Figure 5C.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a toothbrush with longitudinal to lateral motion conversion.

The principles and operation of toothbrushes according to the present invention may be better understood with reference to the drawings and the accompanying description.

Referring now to the drawings, Figures 1A-5A illustrate a first embodiment of a toothbrush, generally designated **10**, constructed and operative according to the teachings of the present invention, for brushing teeth **12** within a user's mouth. Toothbrush **10** is configured for use in a primary

direction of motion **14** (Figure 1A) which corresponds to a primary direction of insertion into the mouth as defined by the extensional direction of a toothbrush handle **16** (Figure 2).

Generally speaking, toothbrush **10** includes a plurality of rotatable brush assemblies **18**, mechanically linked so as to move together with handle **16**, the rotatable brush assemblies being deployed so as to define a plane of contact **20** with the teeth. Each rotatable brush assembly **18** includes a wheel **22** configured to be rotatable about an axis **24**, and having a plurality of bristles **26** projecting substantially radially therefrom. Each rotatable brush assembly **18** is configured such that its axis **24** lies substantially parallel to the plane of contact **20** and is inclined relative to primary direction of motion **14** by an angle $\theta$ of between about 15° and about 75°, more preferably between about 30° and about 60°, and most preferably between about 40° and about 50°. Typically, an angle of approximately 45° is most preferred.

As a result of this structure, when toothbrush **10** is inserted into the mouth, positioned with some of bristles **26** in contact with a part of the row of teeth **12** and moved in direction of motion **14**, friction and/or mechanical engagement with the teeth causes rotation of rotatable brush assemblies **18**. Due to the inclination of the axes **24** of rotatable brush assemblies **18** relative to the direction of motion **14**, this rotation introduces a component of motion of the bristles **26** that are in contact with the teeth **12** in a direction perpendicular to direction of motion **14**. As a result, the common side-to-side brushing action performed by most users inherently generates a significant secondary up-down brushing effect.

Before addressing the features of the present invention in more detail, it will be useful to define certain terms as used herein in the specification and claims. Firstly, when defining the geometrical features of the present invention, reference is made variously to the "primary direction of motion **14**", the "primary direction of insertion into the mouth" and "the extensional direction of a toothbrush handle **16**". In a typical case, these are all assumed to be parallel. Conceptually, it is the geometry with respect to the direction of motion

which is essential to proper operation of the present invention. The extensional direction of the handle is chosen as a structural feature which is related to the direction of motion. However, it will be noted that toothbrush handles are often designed to be non-parallel to the head of the toothbrush. For this reason, reference is made to "a primary direction of insertion of the toothbrush into the mouth" defined by the handle configuration. This direction is defined as the projection of the extensional direction of the handle onto plane **20**. This geometrical construct corresponds to the direction of motion which will be performed by a typical user performing a side-to-side type brushing action.

Axis **24** is described as "substantially parallel to plane of contact **20**". This phrase is used to distinguish the configurations of the present invention from the numerous conventional structures where a bristle-supporting element is rotatable about an axis substantially perpendicular to the plane of contact. Such structures are clearly incapable of functioning according to the principles of the present invention. It should be noted that "substantially parallel" in this context should be interpreted broadly to encompass a considerable range of angles (up to as much as ±30°) between axis **24** and plane **20** within which the principles of the present invention are still operative.

With regard to the term "bristles", this is used herein generically to refer to any and all fibers suited for use in toothbrushes, including natural and synthetic bristles.

Turning now to the features of toothbrush **10** in more detail, Figures 3A, 3B and 4 illustrate a first preferred implementation of a rotatable brush assembly **18** for use in the present invention. This form is particularly preferred for its simplicity of production and assembly.

Figure 3A shows wheel **22** with radially projecting bristles **26** prior to assembly. In this case, wheel **22** is formed with axial projections **28** to serve as an axle. This structure can be produced by a range of known manufacturing techniques used in the field. Examples include, but are not limited to, implantation of fiber bundles into softened plastic and injection molding around a prepared arrangement of fibers.

Figure 3B shows the preferred form of a corresponding socket **30** formed in the surface of the head portion of toothbrush **10**. Within, or adjacent to, socket **30** stand two spring brackets **40** which have recesses **42** configured to provide a permanent snap-fit engagement with projections **28** to define the axis of rotation of wheel **22** when assembled. The remainder of socket **30** is shaped to accommodate at least a proportion of bristles **26** in a manner to allow unimpeded rotation thereof of wheel **22**. Optionally, wheel **22** may be formed with a slightly projecting hub **44** surrounding projection **28** so as to provide a well defined reduced-area contact surface with brackets **40**, thereby reducing frictional opposition to rotation of the wheel.

It will be appreciated that the entire body of toothbrush **10**, including the head of the toothbrush formed with sockets **30** and the toothbrush handle, may conveniently be produced as a single integral element by a range of well known techniques such as plastic injection molding around suitable metallic brackets. Preferably, as may be seen in Figure 4, each socket **30** is additionally formed with a drainage channel **46** open to the rear of the toothbrush head to facilitate flushing out and cleaning of the assembly.

It will be noted that a single rotatable brush assembly **18** of the structure described herein would have a tendency to creep laterally from the intended direction of motion. To counteract this tendency, toothbrush **10** preferably includes at least two groups of rotatable brush assemblies **18** inclined in opposite senses relative to the primary direction of insertion. By way of a preferred example, Figures 2, 5A and 5B show embodiments with two groups of rotatable brush assemblies **18** arrayed along two parallel lines with angles of inclination $\pm\theta$, respectively, relative to the primary direction of insertion. In this case, the arrays of rotatable brush assemblies **18** extend parallel to the direction of insertion. The implementations of Figures 2 and 5A differ only in that the sense of inclination of the two rows has been reversed.

Although the rotatable brush assemblies **18** are preferably deployed in groups inclined in opposing senses for the reasons already mentioned, details of the deployment may clearly be varied considerably. Thus, depending upon the

size of the elements, more than two rows may be provided. Optionally, the rows may be staggered, such as is shown in Figure 5B, to achieve effective close packing of the rotatable brush assemblies **18**.

In a first set of implementations of the present invention, rotatable brush assemblies **18** turns freely in both directions. As a result, in the configurations shown in Figures 5A and 5B, rotation of the assemblies causes an inwards brushing action, towards the center of the toothbrush head, when the toothbrush is advanced forward within the mouth, and an outward brushing action as it is withdrawn. Although this alternating direction is believed to be acceptable in many application, it is believed that superior results may sometimes be provided by modifying the assemblies to rotate exclusively in one direction, providing a ratchet-type functionality. This feature is preferably used to configure the rotatable assemblies to brush exclusively inwards, so that they do not turn during alternate strokes of the toothbrush. One preferred implementation of this optional feature is illustrated in Figure 4.

Specifically, wheel **22** is shown here to have an axial dimension between hubs **44** slightly smaller than the spacing between brackets **40** so that it only one hub is in contact with its adjacent bracket at any time. One of hubs **44** is made smooth, while the other is enlarged and/or modified by addition of radial ribs **48** or other surface features configured to provide increased friction. The region of one bracket **40** opposite to the increased friction surface is preferably also roughened in a complementary manner.

This structure provides a very simple and reliable, but yet effective, ratchet-type function. Specifically, when the toothbrush is advanced in a first direction, the forces on wheel **22** move it axially to a first position in which the smooth hub **44** contacts the corresponding bracket **40**, thereby allowing wheel **22** to turn freely during operation as described above. When the direction of toothbrush motion is reversed, wheel **22** moves axially to contact the second bracket. In this position, the increased friction surfaces of the second hub and corresponding bracket are brought into contact, generating sufficient frictional

resistance to substantially prevent rotation of wheel **22** during the reverse toothbrush stroke.

According to a further optional feature, the rotating brush assemblies may be configured to operate during both stroke directions of the toothbrush exclusively inwards (or outwards) with respect to the toothbrush head. This may be achieved by use of a swivel-mounted rotatable brush assembly, as will now be described with reference to Figures 5C and 6.

Specifically, in this example, each assembly **18** is configured to swivel about a swivel axis **50** substantially perpendicular to contact plane **20** so that its axis of rotation **24** can vary over a range of $\pm\theta$ relative to direction of motion **14**. Swivel axis **50** is preferably offset relative to the axis **24** of wheel **22** so that forces acting on wheel **22** from friction of bristles **26** with the teeth generate a turning moment about swivel axis **50** tending to swivel the assembly to the desired angle.

Structurally, details of a preferred implementation are shown in Figure 6. Swivel axis **50** is here provided by a rotary sliding bearing **52** which is implanted within the base of an enlarges socket **30**. Brackets **40** here extend upwards at an angle to provide the aforementioned offset between swivel axis **50** and the axis **24** of wheel **22**.

Turning now to Figures 7-10, it should be noted that the rotatable brush assembly **18** of Figures 3 and 4 is one preferred example chosen from a large number of possible implementations. By way of illustration, Figures 7-10 show a number of alternative implementations.

Referring to Figures 7A and 7B, these show a structure generally similar to that of Figures 3 and 4, but wherein socket **30** features two shaped recesses **32** integrally formed on opposite sides of the socket to provide a snap-fit engagement with projections **28**. In this case, just over half of each wheel **22** is housed within the head of the toothbrush when assembled. Optionally, socket **30** may have an increased width portion around its periphery, i.e., remote from recesses **32**, to allow free rotation of the wheel even if bristles **26** become bent apart as a result of extensive use.

Turning now to Figure 8, this shows an alternative implementation of rotatable brush assemblies **18** in which wheels **22** have hollow axial recesses or bores **34** which receive axle elements **36** which are supported above a surface of the toothbrush head by support posts **38**. The result is a series of wheels rotatably mounted on a zigzag frame standing above the surface of the toothbrush head. Axle elements **36** may either be complete rods, or may be implemented as pairs of opposing projections which snap-fit into recesses or bores **34** on opposite sides of each wheel **22**.

Figure 9 shows a further alternative implementation in which each wheel **22** is formed from two parts which lock together to form a double wheel structure with a peripheral annular groove **54** which cooperates with a complementary slip ring **56**. In this case, the two parts of wheel **22** are preferably snap-fitted or otherwise attached to each other during assembly of the toothbrush in position engaged with slip ring **56** as shown.

Finally, with reference to Figure 10, it should be noted that the aforementioned swivel-mounted rotatable brush assembly may also be implemented in alternative forms. By way of example, Figure 10 shows a possible implementation in which a central, non-turning hub **60** of wheel **22** is mounted on a support bar **62** to provide a swivel joint offset from the center of central hub **60**. The rotating portion of wheel **22** is implemented as an outer ring **64** deployed externally in sliding relation to central hub **60**.

It will be appreciated that the above descriptions are intended only to serve as examples, and that many other embodiments are possible within the spirit and the scope of the present invention.

WHAT IS CLAIMED IS:

1. A toothbrush for brushing teeth within a mouth of a user, the toothbrush comprising:

(i) a handle configured to define a primary direction of insertion of the toothbrush into the mouth; and

(ii) a plurality of rotatable brush assemblies mechanically linked so as to move together with said handle, said rotatable brush assemblies being deployed so as to define a plane of contact with the teeth, each of said rotatable brush assemblies including a wheel configured to be rotatable about an axis, said wheel having a plurality of bristles projecting substantially radially therefrom,

wherein each of said rotatable brush assemblies is configured such that its aforementioned axis lies substantially parallel to said plane of contact and is inclined relative to said primary direction of insertion by an angle of between about 15° and about 75°.

2. The toothbrush of claim 1, wherein said axis of each of said rotatable brush assemblies is inclined relative to said primary direction of insertion by an angle of between about 30° and about 60°.

3. The toothbrush of claim 1, wherein said axis of each of said rotatable brush assemblies is inclined relative to said primary direction of insertion by an angle of between about 40° and about 50°.

4. The toothbrush of claim 1, wherein said plurality of rotatable brush assemblies includes a first group for which the axis of rotation is inclined in a first sense relative to said primary direction of insertion and a second group for which the axis of rotation is inclined in a second sense, opposite to said first sense, relative to said primary direction of insertion.

5. The toothbrush of claim 4, wherein said first group includes a plurality of said rotatable brush assemblies arrayed along a first line substantially parallel to said direction of insertion, and wherein said second group includes a plurality of said rotatable brush assemblies arrayed along a second line, parallel to but displaced from said first line.

6. The toothbrush of claim 1, wherein each of said rotatable brush assemblies includes at least one feature configured to inhibit rotation of said wheel in a given direction about said axis.

7. The toothbrush of claim 1, wherein each of said rotatable brush assemblies is mounted relative to said handle via a swivel mounting such that said rotatable brush assemblies can swivel about a swivel axis substantially perpendicular to said plane of contact, said swivel axis being offset relative to said axis of rotation of said wheel.

8. The toothbrush of claim 1, further comprising a toothbrush head portion integrally formed with said handle, said head portion including a recessed socket for each of said rotatable brush assemblies, a part of each rotatable brush assembly being received within a corresponding one of said recessed sockets.

9. A method for brushing along a row of teeth so as to generate a brushing action perpendicular to a direction of motion, the method comprising:

(i) providing a toothbrush including at least one rotatable brush assembly including a wheel configured to be rotatable about an axis, the wheel having a plurality of bristles projecting substantially radially therefrom;

(ii) positioning the toothbrush with a number of the bristles in contact with a part of the row of teeth; and

(iii) moving the toothbrush along the row of teeth in a direction of motion,

wherein the at least one rotatable brush assembly is oriented with its axis inclined at an angle of between about 15° and about 75° to the direction of motion such that rotation of the wheel caused by the movement generates a component of motion of the bristles substantially perpendicular to the direction of motion.

10. The method of claim 9, wherein the at least one rotatable brush assembly is oriented with its axis inclined at an angle of between about 30° and about 60° to the direction of motion.

11. The method of claim 9, wherein the at least one rotatable brush assembly is oriented with its axis inclined at an angle of between about 40° and about 50° to the direction of motion.

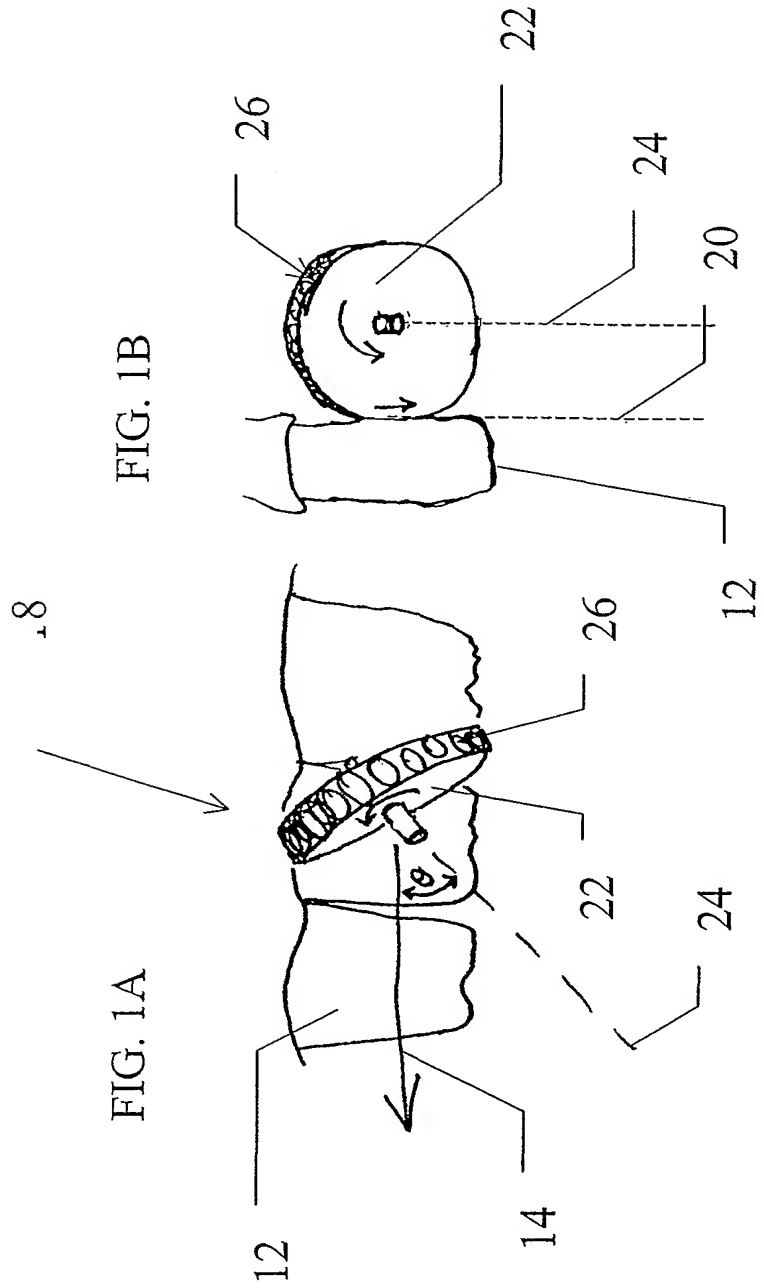



FIG. 1B

FIG. 1A

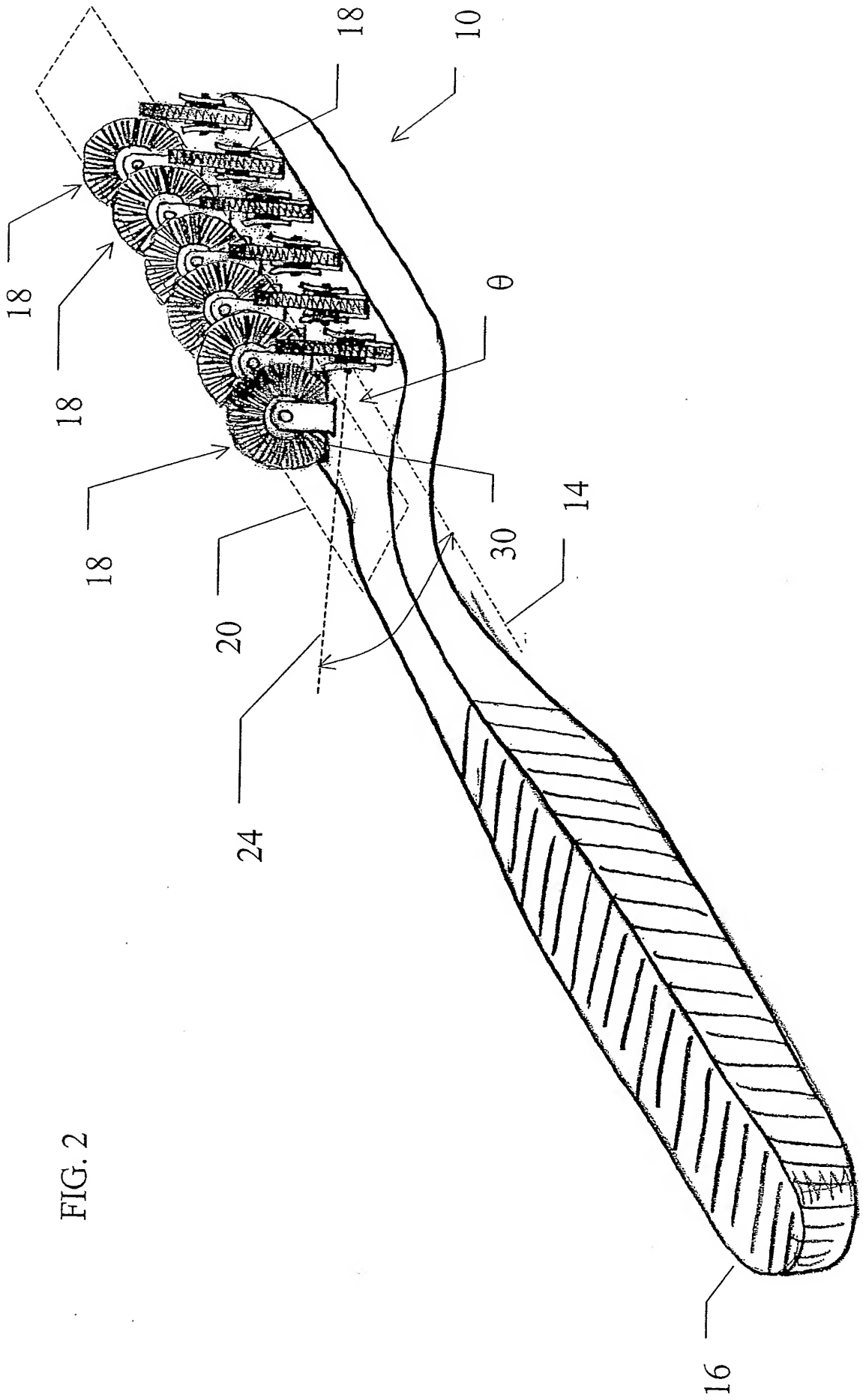



FIG. 2

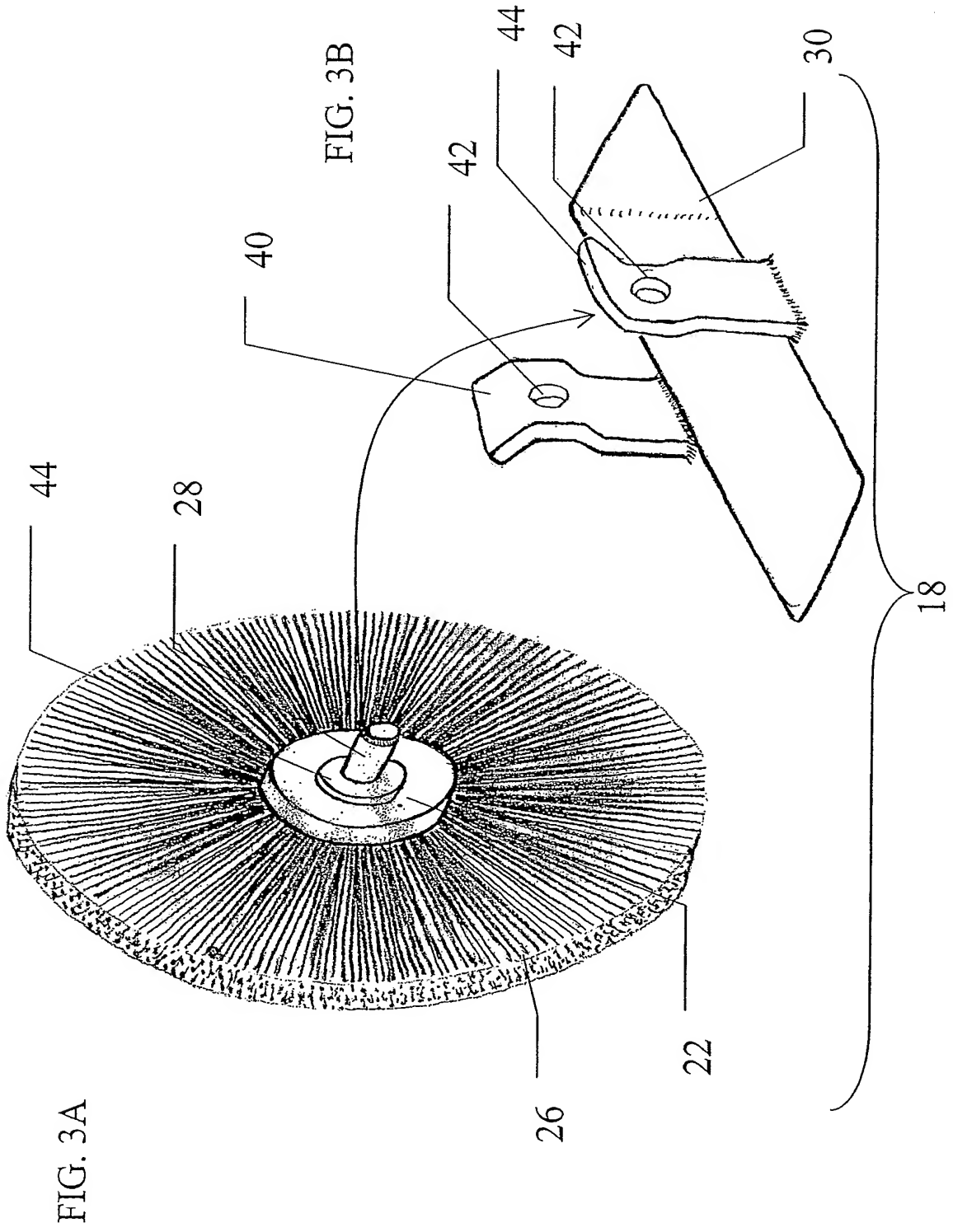



FIG. 3A

FIG. 3B

FIG. 4

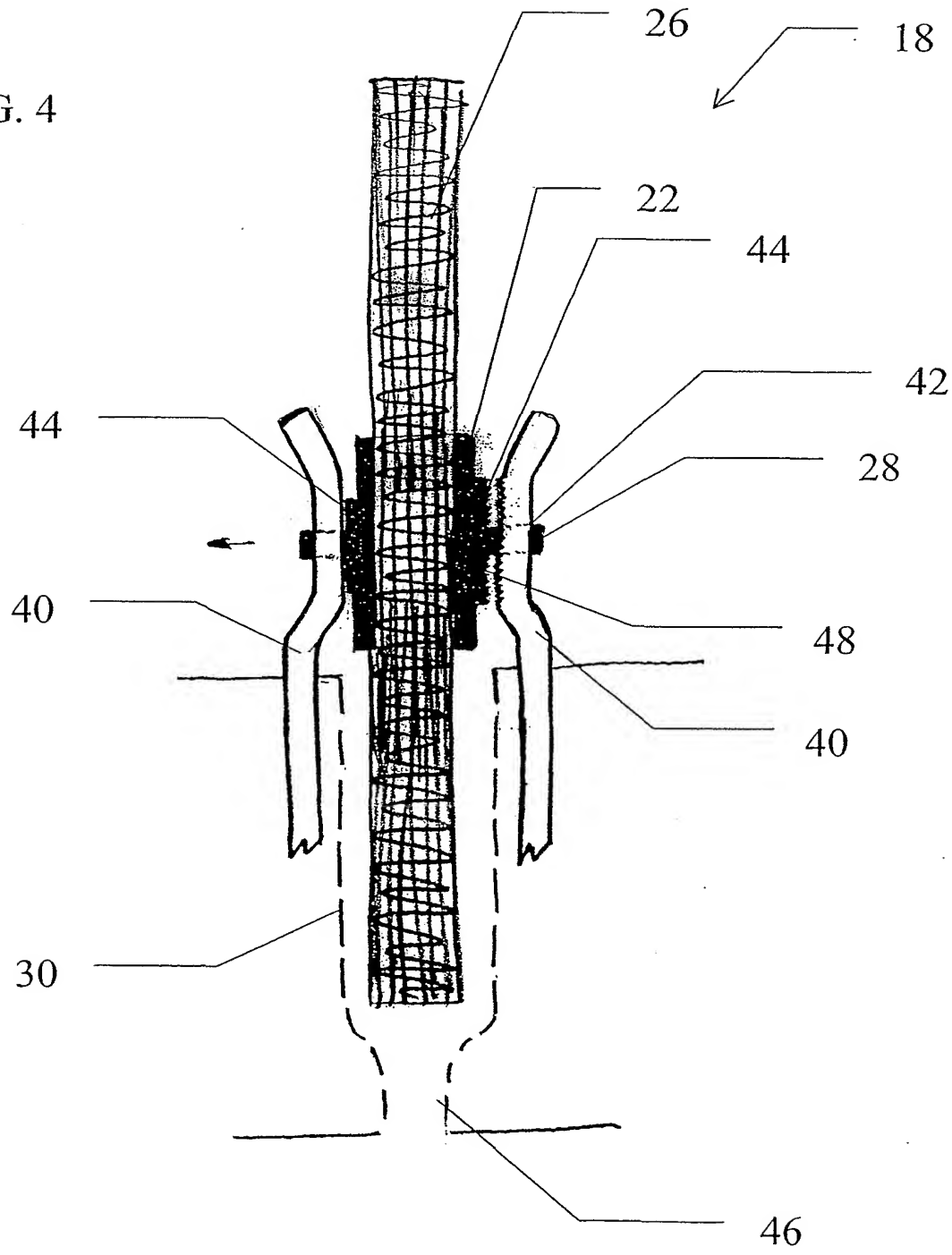


FIG. 5A

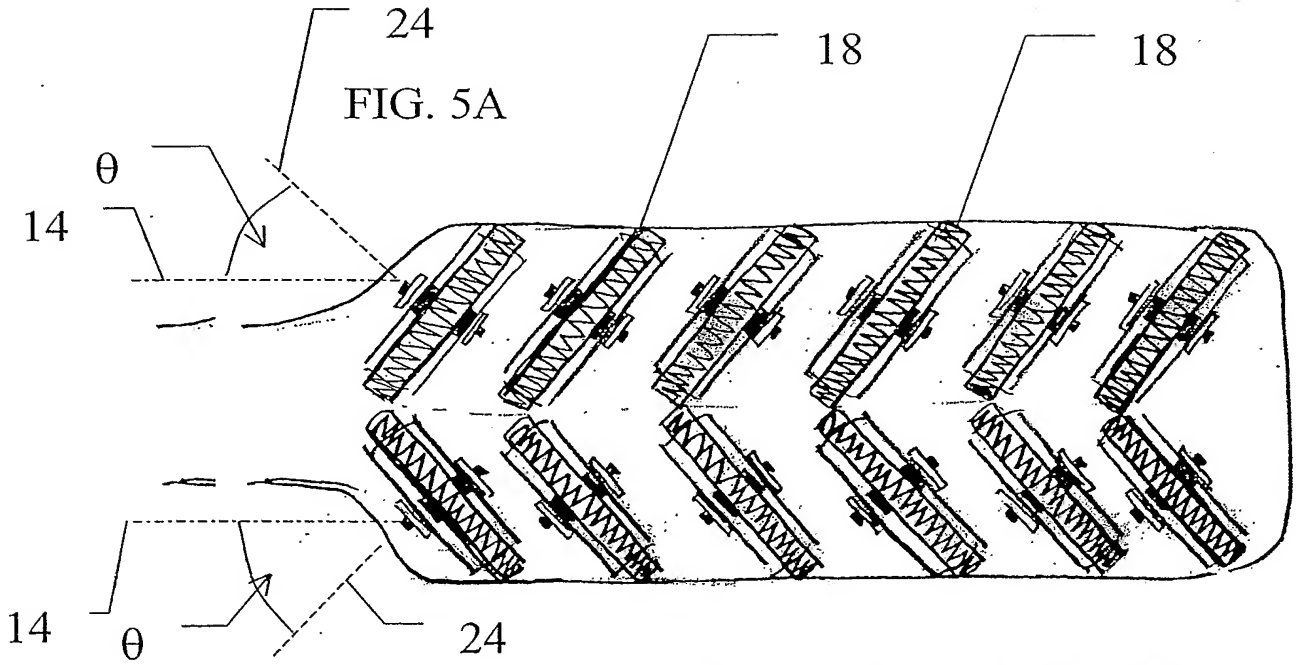



FIG. 5B

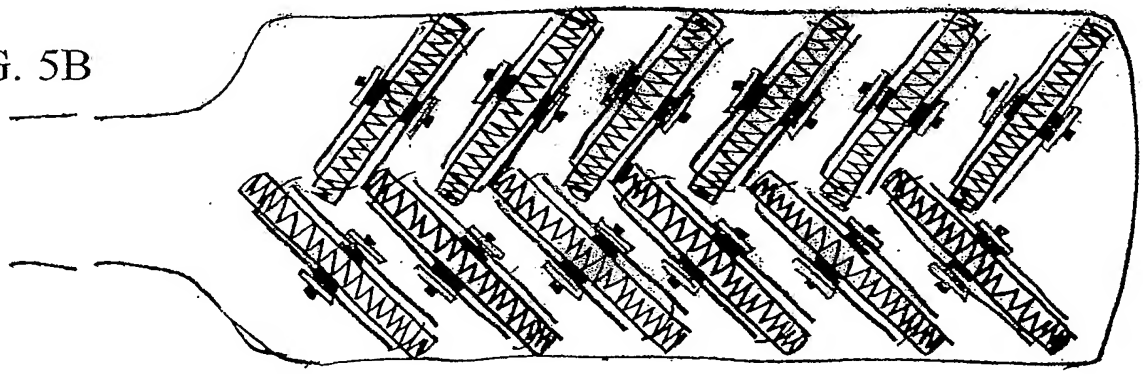
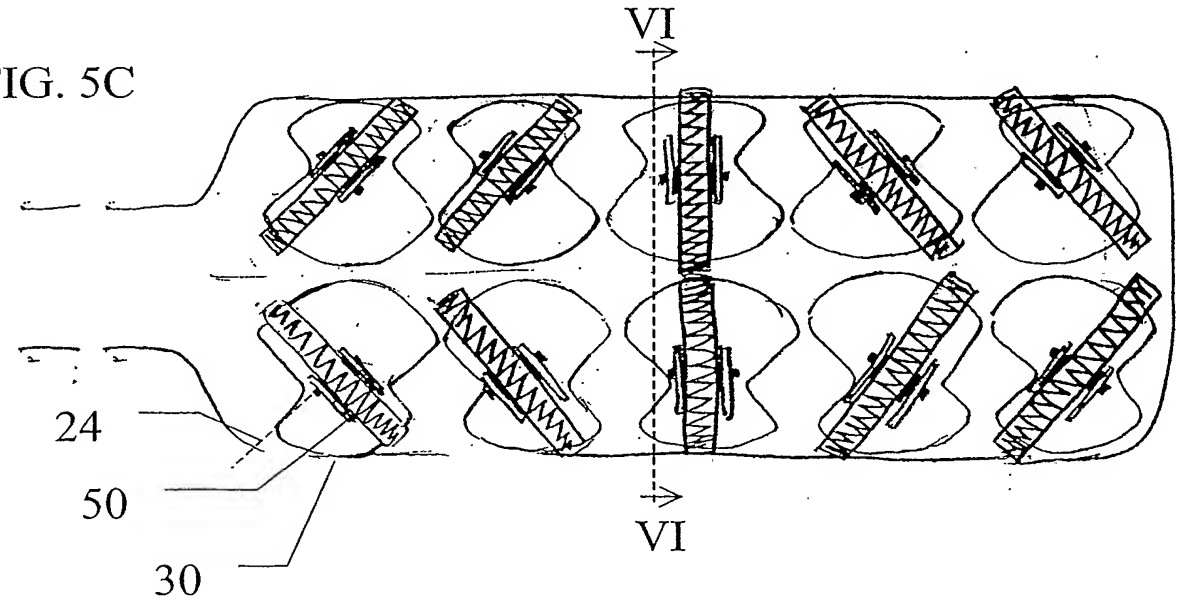


FIG. 5C



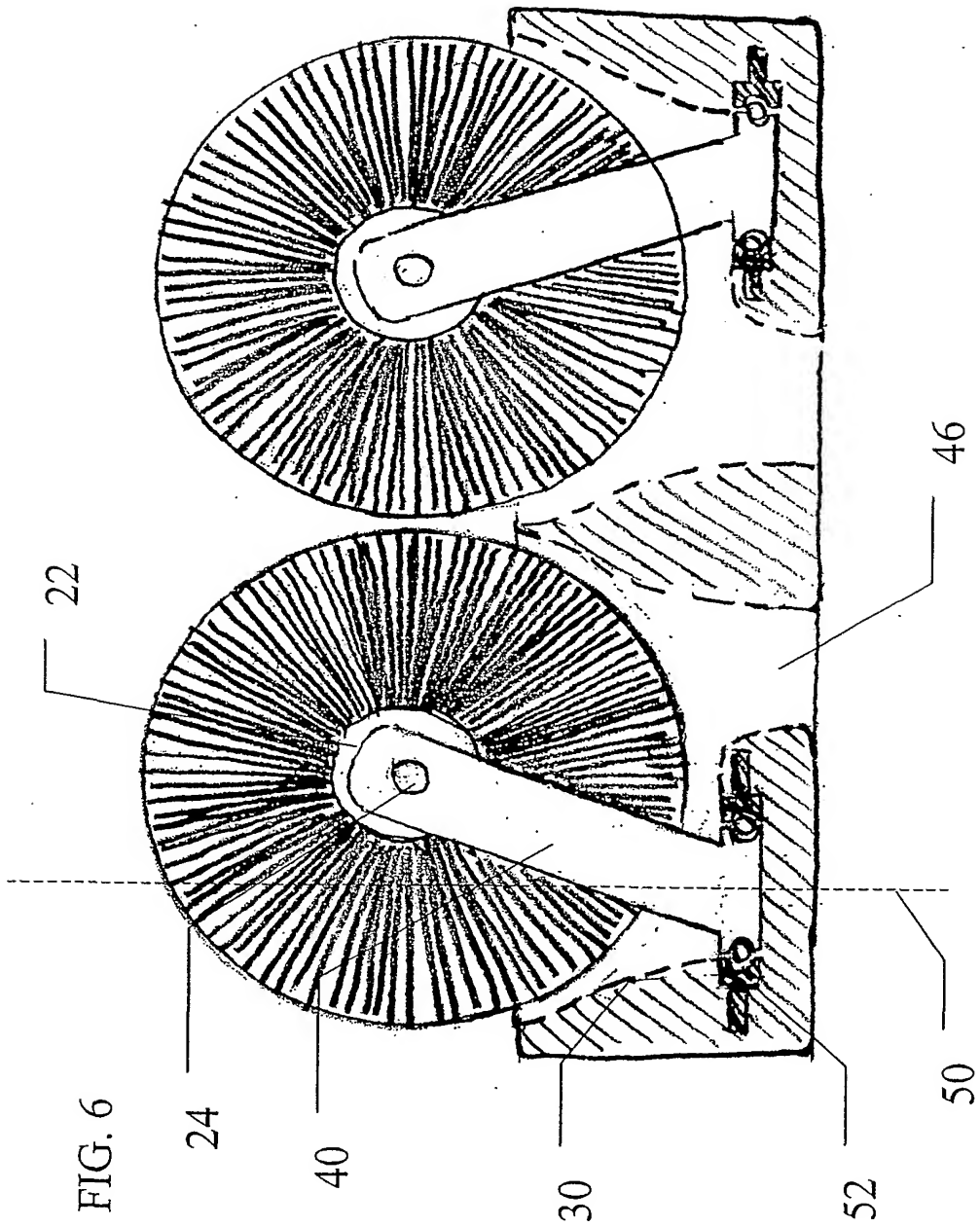



FIG. 6

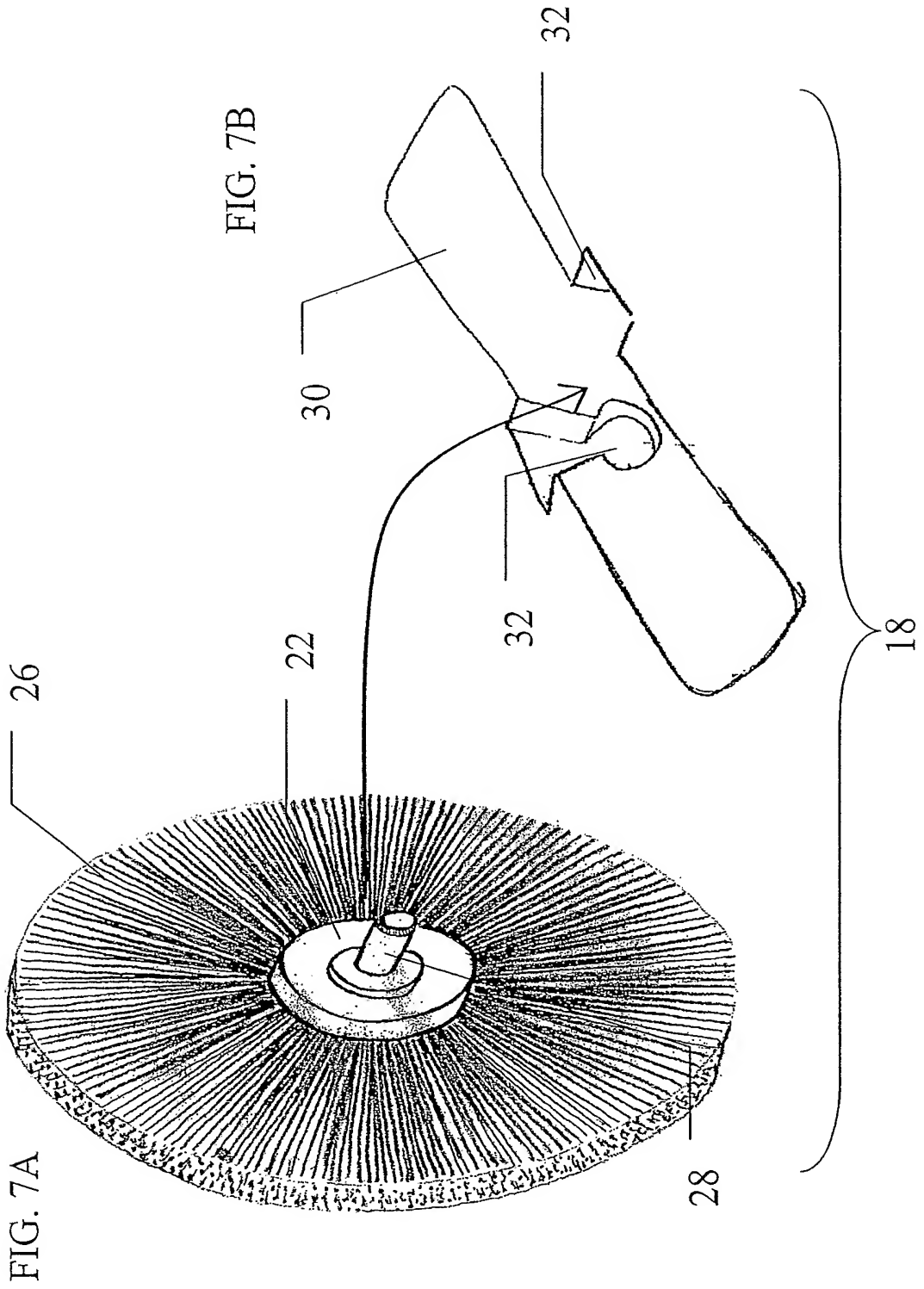



FIG. 7A

FIG. 7B

FIG. 9

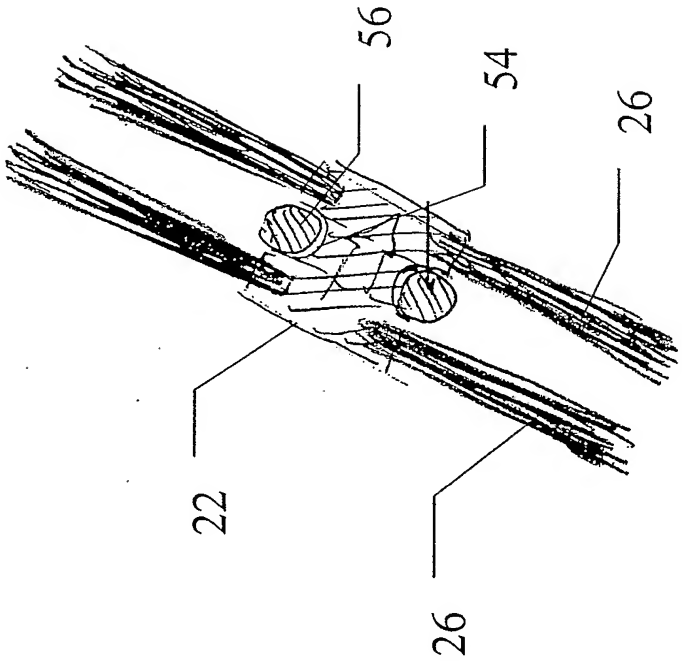
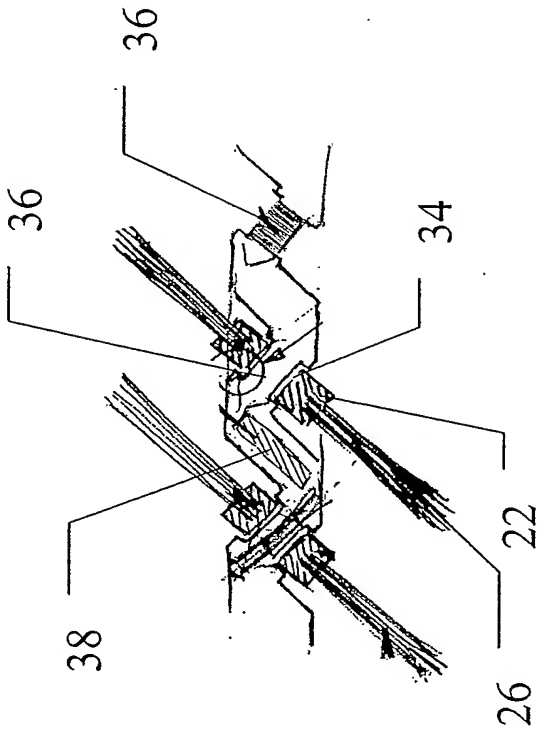



FIG. 8



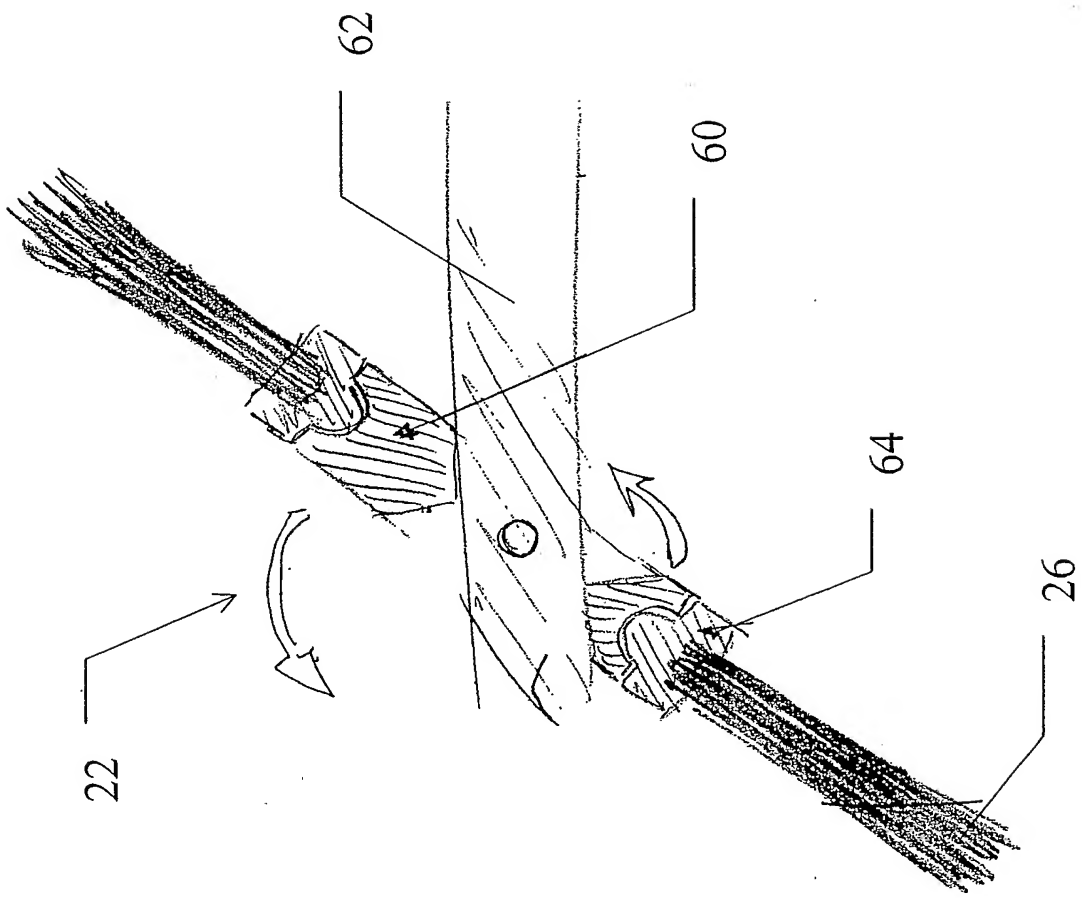



FIG. 10

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL01/00650

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A46B 7/10, 9/04

US CL :15/22.1, 27, 167.1; 433/216; D4/109

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 15/22.1, 23, 25-27, 167.1; 433/216; D4/109

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 4,438,601 A (OLSON) 27 March 1984, see figure 1 and column 2, lines 15-19. | 1-3 |
| X | DE 63,528 C (FELLER) 29 July 1892, see figure 1. | 1-3 |
| A | US 1,091,090 A (TACAIL) 24 March 1914, see entire document. | 1-11 |
| A | US 1,254,532 A (PAUL) 22 January 1918, see entire document. | 1-11 |
| A | US 1,503,050 A (JURK et al) 29 July 1924, see entire document. | 1-11 |
| A | US 2,175,975 A (STEINER) 10 October 1939, see entire document. | 1-11 |

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

| | | | |
|---|---|---|---|
| * | Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
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| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | | |

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 06 DECEMBER 2001 | 27 DEC 2001 |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231 | Authorized officer<br>MARK SPISICH |
| Facsimile No. (703) 305-3230 | Telephone No. (703) 308-0661 |

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# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL01/00650

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | SU 1,708,282 A (IGNATOVICH) 30 January 1992, see entire document. | 1-11 |